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# MEMOIRS

OF THE

# GEOLOGICAL SURVEY

OF

## THE UNITED KINGDOM.



ILLUSTRATIVE OF

## BRITISH ORGANIC REMAINS.

DECADE I.-VI

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## N O T I C E.

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PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service. Although numerous drawings had previously been made, and engravings from them considerably advanced, it was not thought expedient to commence their publication until the large collections of the Survey could be well examined, which a want of the needful space has, until the present time, considerably retarded. This impediment to progress is now being removed, and when the collections can be properly displayed in the New Museum of Practical Geology, in Jermyn Street, it is hoped that the public will have an opportunity of gradually obtaining, in a convenient manner and at small cost, a work illustrating some of the more important forms of animal and vegetable life there preserved, and which have been entombed during the lapse of geological time in the area occupied by the British islands.

The plan proposed to be followed in the work, of which the two Decades now published form a part, is as follows:—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all



## B R I T I S H F O S S I L S.

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### DECADE THE FIRST.

THE first Decade of representations of British Fossils is devoted to a selection of Echinoderms, of the Orders *Asteriadæ* and *Echinidæ*.

With the exception of the *Crinoideæ* and *Cystideæ*, no special monographs have been devoted to the illustration of our fossil species of Echinodermata, notwithstanding their acknowledged importance in a geological point of view. The majority of species found in British strata are unfigured in British works; a very great number are not figured at all, and those of which we possess British figures are, for the most part, delineated either imperfectly or insufficiently for the demands of science in its present state. This is the more remarkable since, for the description and delineation of numerous species, ample materials exist in collections.

Of the following plates, one is devoted to figures of all the Silurian star-fishes as yet discovered in British strata. None of these have hitherto been represented in any work. Their names only, accompanied by short descriptive characters, have appeared in the "Synopsis of British Fossil Asteriadæ," contained in the second part of the second volume of the "Memoirs of the Geological Survey of Great Britain." Some remarkable new forms of star-fishes from the Oolites, and all as yet discovered in the London clay, are figured in the second and third plates.

The fourth plate is devoted to a representation of the only fossil as yet discovered of the family *Euryales*, now for the first time described and figured, through the kind co-operation of the Rev. Professor Sedgwick.

In the six following plates a series of illustrations of the British fossil *Echinidæ* is commenced, of the majority of which, even the commonest and those most important for the identification of strata, no good representations are accessible to the student of English fossils. The importance of a knowledge of the members of this family to the explorers of oolitic and cretaceous strata cannot be too strongly insisted on, and their beauty and interest, in a purely Natural History point of view, render them admirable subjects for elaborate delineations.

When the collections accumulated during the course of the progress of the Geological Survey have been thoroughly examined and arranged, new light may be expected, bearing on the details of structure of the species now figured. Additions will consequently be made to the plates from time to time; and it is proposed to issue supplementary figures of the variations of form exhibited by the several species selected as subjects for these decades.

EDWARD FORBES.

May, 1849.

# B R I T I S H F O S S I L S.

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## DECade I. PLATE I.

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### SILURIAN SPECIES OF URASTER.

[Genus URASTER. AGASSIZ. (Sub-kingdom Radiata, Class Echinodermata, Order Asteriadæ. Family Urasteriæ). Body stellate, five-rayed; a vent on the dorsal surface; rays rounded, surface spinous; ossicula small, compressed, irregular, reticularly combined; ambulaera bordered by three sets of spines; suckers quadrilateral. The genera ASTERACANTHION of MÜLLER and TROSCHEL, and ASTERIAS (restricted) of J. E. GRAY, are synonymous with URASTER.]

FIG. 1.

#### URASTER RUTHVENI.

E. FORBES, in "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 463.

DIAGNOSIS. *U. brachialis quinis teretibus, longissimis, angustis, subcarinatis; disco parvo; paginâ superiori reticulatâ, spinosâ, spinis obtusis fasciculatis. Ossiculis ambulacralibus linearibus, longis, geniculatis.*

Description.—Body very small, in the centre of five tapering linear lanceolate, rounded rays, subcarinated on their upper surfaces, five times as long as the disk is broad. The upper surfaces of both rays and disk are reticulated, indicating a structure which originally in all probability consisted of spines grouped in tufts. The under surfaces are marked by the impressions of a double series of ambulacral articulations, each slightly curved. Both these structures are present in some existing antarctic forms of *Uraster*. The largest specimen examined measured three inches and a half across, from arm-tip to arm-tip.

Affinities.—The slender lanceolate arms distinguish this species from any of its palæozoic allies as yet described. In general form it resembles some living species.

Locality and Geological Position.—This interesting starfish was discovered by Mr. John Ruthven, in strata of the Ludlow division of Silurian rocks at Scalthwaiterigg, and also at Highthorns, both near Kendal, in Westmoreland. Professor Sedgwick, in whose collection it is contained, kindly communicated the specimen for description and delineation.

FIG. 2 *a.* (upper side) and *b.* (under side).

**URASTER PRIMÆVUS.**

E. FORBES, in "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 463.

**DIAGNOSIS.** *U. brachiis quinis, brevibus, triangularibus, acuminatis; disco lato. Paginâ superiori tuberculatâ, reticulatâ (spinosâ? spinis obtusis fasciculatis?) ossiculis ambulacralibus oblongis, latis, geniculatis.*

**Description.**—Body very broad, pentagonal, produced at the angles into five short lanceolate or elongato-triangular pointed arms, which are each about two-thirds as long as the breadth of the disk. Surface of the disk convex above, as well as the arms tuberculated and reticulated, exhibiting traces of having been covered by tufts of short blunt spines. Madreporiform plate sub-central, as well as vent. Beneath nearly flat, the interambulacral spaces reticulated like the upper surface, the ambulacra composed of broad, oblong, geniculated plates, of which there are about twenty in a row. The largest specimens examined had attained the dimensions of an inch and a half in diameter, measuring from arm-tip to arm-tip.

**Affinities.**—The general shape of this species reminds us of *Asterina*, but its structure is so similar to that of the next fossil to be described, that I do not doubt it was a true *Uraster*. The pointed rays distinguish it at sight from *U. obtusus*, its nearest ally.

**Locality and Geological Position.**—First found by Mr. John Ruthven, in the Silurian (Ludlow) rocks at Underbarrow, near Kendal. It occurs in a thin sub-calcareous band, loaded with encrinites and trilobites, all rare in the overlying sandstones. Numerous specimens have been collected by Professor Sedgwick and Mr. Daniel Sharpe, both of whom have communicated them for examination and delineation.

FIG. 3.

**URASTER OBTUSUS.**

E. FORBES, in "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 463.

**DIAGNOSIS.** *U. brachiis quinis, brevibus, convexis, lanceolatis, obtusis; longitudine brachiarum ad latitudinem disci ut 1 : 1½, ossiculis ambulacralibus oblongis, latis, intersticiis linearibus; paginâ superiori reticulato-spinosâ.*

**Description.**—Body rather broad (being broader than the arms are long), convex above, spinosely reticulate; the spines were short, and probably grouped in tufts. The arms are short, convex above, broad,

oblong, and obtuse. Their under surfaces exhibit oblong, rather broad, ambulacral plates, gradually decreasing in size towards the tips of the arms, but nearly equal for about two-thirds of their length. The ambulacral sulcus between them is rather broad. The largest specimen examined measured an inch and a half across.

*Affinities.*—The contour of this fossil star-fish strikingly reminds us of that of the living *Uraster hispidus*, but the structure of its dermal covering was very different. With no fossil as yet discovered can it be confounded.

*Locality and Geological Position.*—First found in lower Silurian rocks, at Drumcannon, near Waterford, in 1846, by Sir Henry De la Beche, Captain James, R.E., and the describer; since by Mr. Gibbs, of the Geological Survey, in Bala rocks, at Moel y Garnedd, near Bala, North Wales. In the Irish locality it was associated with *Phacops Jamesii* and numerous *Orthides*. In the Welsh with *Orthides*, Trilobites of the genera *Asaphus* and *Homalonotus*, and numerous stems of *Encrinites*.

FIG. 4.

## URASTER HIRUDO.

E. FORBES, "Memoirs of the Geological Survey of Great Britain," vol. ii. part 2, p. 464.

*DIAGNOSIS.* *U. brachis quinis, lineari-lanceolatis, acuminatis, disco minuto; paginâ superiori reticulatâ, decussatâ (spinis fasciculatis, fasciculis spinarum seriebus longitudinalibus dispositis) ossiculis ambulacralibus oblongis, ambulacris latis.*

*Description.*—Body very minute, about a fourth as broad as the rays are long; rays tapering and linear-lanceolate, contracted at their bases, pointed at their extremities. Their upper surface clothed with bundles of spines arranged in very regular rows, and so placed that each ray seems to be marked by three or four longitudinal furrows, crossed at regular intervals by transverse grooves. Under surface with short ambulacral plates and broad avenues. The largest specimens do not measure more than an inch across.

*Affinities.*—Unlike any fossil star-fish with which I am acquainted, and possibly not a member of this genus.

*Locality and Geological Position.*—Gregarious in Silurian (Ludlow) rocks at Pottersfell, near Kendal, in Westmoreland; first found by Mr. John Ruthven, and communicated by Professor Sedgwick. Its aspect reminds us of *Ophiura*.

The materials afforded by the specimens hitherto procured of Silurian star-fishes are too imperfect to admit of more extended descriptions than those here given. They are sufficient, however, to enable us to pronounce with confidence on the tribe, and even genus, to which they have belonged, and to assert, without hesitation, that the several species described are distinct from one another. They are very interesting, inasmuch as they exhibit the earliest forms of the order *Asteriadæ*. Until within very few years past, it was supposed to have no palæozoic representatives; instead of which we now find them in the oldest fossiliferous strata. On the Continent palæozoic star-fishes have hitherto been noticed only in France, and much higher in the series of rocks than those now figured. In North America several forms have been found, apparently nearly allied to our own, and in rocks of silurian age. The genus to which I have referred these Silurian star-fishes is one of the most cosmopolitan of all the groups of the order, having representatives at present in arctic and antarctic, tropical and temperate, seas; the individuals are perhaps most abundant in northern regions. Some of the species have a considerable bathymetrical range.

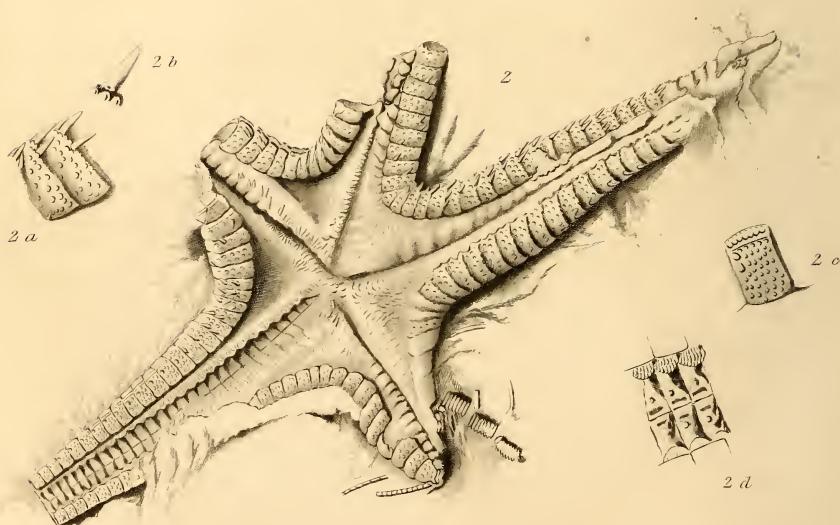
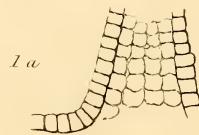
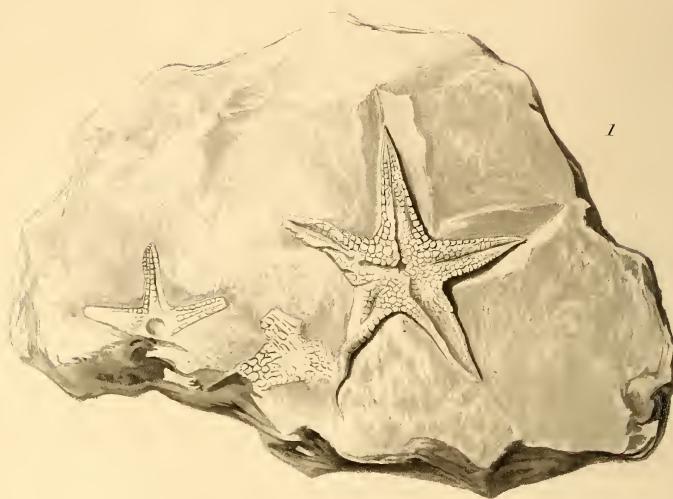
E. FORBES.

*April, 1849.*

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Geological Survey of the United Kingdom.

ASTROPECTEN  
(Oolitic)1 ASTROPECTEN HASTINGIAE *Forbes*2 ————— PHILLIPSII *Forbes*